EFFECTIVENESS OF CONSTRAINT INDUCED MOVEMENT THERAPY ON UPPER EXTRIMITY FUNCTIONS IN PEDIATRIC HEMIPLEGIC CEREBRAL PALSY

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Abstract:
BACKGROUND: The frequency of CP is 0.66 per 1000 between the ages of 6 and 15. Postnatal hemiplegia, mostly postinfectious, iatrogenic, or posttraumatic, accounted for 11% of all cases. 42% of term children with congenital hemiplegia (pre and perinatally derived) had prenatal causes, 9% had combined pre and perinatal causes, 16% had perinatal causes, and 34% had untraceable causes. When performing daily tasks with one hand, children with hemiplegic cerebral palsy typically ignore or don't use their injured limb. Its goal is to enhance spontaneous use of the afflicted upper limb. The two essential principles of CIMT are mass practice of therapeutic tasks with the injured limb and restriction of the unaffected limb. The goal of this research is to determine how well CIMT (Constraint Induced Movement Therapy) works for enhancing upper extremity function in hemiplegic cerebral palsy children between the ages of 3 and 11 years.
MATERIALS AND METHODS: A quasi-experimental study was done and a total of 30 children having hemiplegic cerebral palsy between 3-11 years were selected and treated with Constraint induced movement therapy for upper extremity. Treatment includes shoulder and elbow strengthening: pushing up through hands, climbing and wrist, hand and finger strengthening: squeezing games, paper scrunching, tongs and tweezers was given for 4 weeks. Modified Ashworth Scale and UEFI results from pre-intervention at 1st week and post-intervention at 4th week are used to evaluate the youngsters.
RESULT: Statistics were used to evaluate the values using the paired 't test. The statistical examination of the quantitative data revealed a statistically significant difference between the pre-test and post-test values of MAS and UEFI. The UEFI was 32.77 and the MAS' post-test mean value was 0.62. This demonstrates that CIMT significantly improved the upper extremity functions of the children with hemiplegic cerebral palsy.
CONCLUSION: Constraint Induced Movement Therapy has been found to be beneficial in enhancing upper extremity functions in children with hemiplegic cerebral palsy.

***Keywords*: Cerebral palsy, CIMT, MAS, upper extremity, UEFI.**

INTRODUCTION:

Movement problems that interfere with a child's development are known collectively as cerebral palsy (CP).This is the most prevalent childhood motor impairment. A delay in reaching motor or movement milestones is the most common symptom of CP. [1] Cerebral palsy (CP) affects posture, muscular tone, and movement development. The underlying etiology involves injury to the developing brain during pregnancy and the first few months of life. [2]. While the primary neuropathologic damage is not progressive, children with CP may over time acquire a variety of secondary disorders that will have varying effects on their functional ability[3].

The term "CP" describes a collection of pervasive movement and postural abnormalities that restrict activities and are thought to be caused by nonprogressive aberrations in the developing fetus or immature brain. Seizures, secondary musculoskeletal problems, and changes of sensation, perception, cognition, communication, and behavior are usually present along with the motor deficits of CP. [4]

The primary cause of cerebral palsy is brain damage. The pyramidal tracts or the motor cortex in the brain are usually injured [5]. A form of unilateral cerebral palsy known as hemiplegia affects only one side of the body. The arms are frequently affected more than the legs. Hemiplegia is characterized by abnormal muscular control, stiffness, and weakness. [6] Muscle wasting, tingling hands and feet, or both, is a very common and unpleasant symptom. The patterns of upper limb motor involvement are influenced by the muscles affected, the level of spasticity or dystonia present, and the patient's age. Some patterns are more prevalent than others[7], such as wrist flexion-pronation contracture, elbow flexion contracture, and shoulder adduction internal rotation contracture. A swan-neck deformity in the fingers can result from attempts to oppose wrist flexion by engaging lengthy finger extensors or hand intrinsic spasticity, or alternatively, the fingers can become clasped. Thumb in palm deformities in the hands can be produced by intrinsic or extrinsic muscular contracture. These issues work together to inhibit correct hand positioning in space, as well as proper grip and release. [8]

Modern therapy called Constraint Induced Movement Therapy (CIMT) asserts to improve the motor skills and functional use of a paretic arm. CIMT forces the use of the affected side by restricting the unaffected side[9]. Constraint-induced movement therapy (CIMT) is becoming more popular as a treatment option for children with hemiplegic cerebral palsy. It seeks to lessen the negative effects of taught non-use while promoting spontaneous use of the injured upper limb[10]. The two guiding concepts of this therapy

are (a) constraining the arm and hand that is least affected and (b) intense, regular training of activities using the affected arm and hand[11].Overcoming learned nonuse and plastic brain re-modeling are two neurophysiologic mechanisms considered to underlie the therapeutic benefits of CIMT [12]. When the afflicted extremity is used often and intensely for a variety of activities, the brain alters. This is how CIMT has an impact: cortical restructuring, branched dendrites, learned synaptic strength through redundancy.[13]

The components of CIMT include: Restricting the arm that is less harmed, Massaging of the more afflicted arm with repetitive, systematic, practice, and rigorous therapy. Monitoring how the arm is used in real-world circumstances and coming up with solutions to overcome real or imagined obstacles, behavioral-harmony and Treatment journal.[14] Children with hemiplegic cerebral palsy can learn to improve the motor skills of the more affected areas of their bodies and so stop relying solely or predominately[15] on the less affected sections. 90% of the time that participants in the current trial are awake, they wear a glove on the arm that is less affected, and they perform repeated motions with the arm that is more afflicted for six to seven hours each day for two to three weeks. Among the restraints used in CIMT are the sling, plaster cast, triangular bandage, splint, partial glove, and mitt. [16]

CIMT is systematic, repetitive, and focused on the damaged arm restricting the arm that is less harmed. The use of a variety of behavioral methods to transfer clinically gained benefits to the real world (i.e. Making it functional). [17] With the aid of strengthening exercises like shoulder, elbow, hand, wrist, and finger strengthening exercises, which may include climbing, pushing up with hands, squeezing ball, picking up of soft materials like tongs and tweezers, picking up of paper scrunching, etc., we can improve the functions of the upper extremity for hemiplegic cerebral palsy children. The following 10 x 10 x 10 eligibility requirements must be met when selecting a patient for CIMT:

* Actively extending any other two fingers on the affected hand by 10 degrees.
* Actively abducting the thumb by 10 degrees on the affected hand[18].

Patients with hemiparesis were found to be hemi-neglecting[19], or not using their affected extremity.[19] Upper Extremity Functional Index (UEFI) is used as an outcome measure to check the functional disability of upper extremity and Modified Ashworth Scale is used to check the spasticity levels in upper extremity of children.

METHODOLOGY:

INCLUSION CRITERIA:

- Children with cerebral palsy who are hemiplegic.
- Between the ages of 3 and 11 years.
- Both boys and girls.
- Ful-filling 10 x 10 x 10 eligibility criteria of CIMT.
- Limited spasticity according to Modified Ashworth scale.

EXCLUSION CRITERIA:

- Children with visual impairment.
- Children having cardiac anomaly like VSD.
- Cognitive dysfunction is more.

Total of 30 convenient samples of age 3-11 years were selected based on inclusion and exclusion criteria. The study's purpose was conveyed to the patients' parents, and subjects' written agreement was acquired.

All the subjects will be under went pre-test values with Modified Ashworth scale and UEFI and same was taken as post-test at the 4th week. The children will be treated with CIMT procedure for the upper extremity with the help of slings, plaster cast, splints, half glove, mitts.The following exercises were made to perform by the children: Shoulder and elbow strengthening which include pushing up through hands and climbing; and also, wrist, hand and finger strengthening which include squeezing games, paper scrunching and tongs and tweezers.The children were made to perform these exercises while restricting the unaffected arm with the help of slings, Mitts, gloves and splints. With the help of treatment diary, we can assess the progress of the child.

RESULTS:

The statistical analysis of the quantitative data showed that the Modified Ashworth Scale had statistically significant differences between the pre- and post-tests, with mean values of 3.27 and 1.60, and standard deviations of 0.64 and 0.62, respectively. According to the Upper Extremity Functional Index (UEFI), which had a mean value of 58.93 in the pre-test and 32.77 in the post-test, the data are likewise statistically significant. Additionally, the pre-test's standard deviation was 6.37, whereas the post-test's was 6.12. It was found that children with hemiplegic cerebral palsy can benefit from Constraint Induced Movement Therapy by having better upper extremity capabilities.

Table-1: PRE-TEST AND POST-TEST MEAN VALUES OF MODIFIED ASHWORTH SCALE.

		Mean	SD	t-value	p-value
Modified Ashworth Scale	PRE-TEST	3.27	0.64	8.6011	<0.0001
	POST-TEST	1.60	0.62		

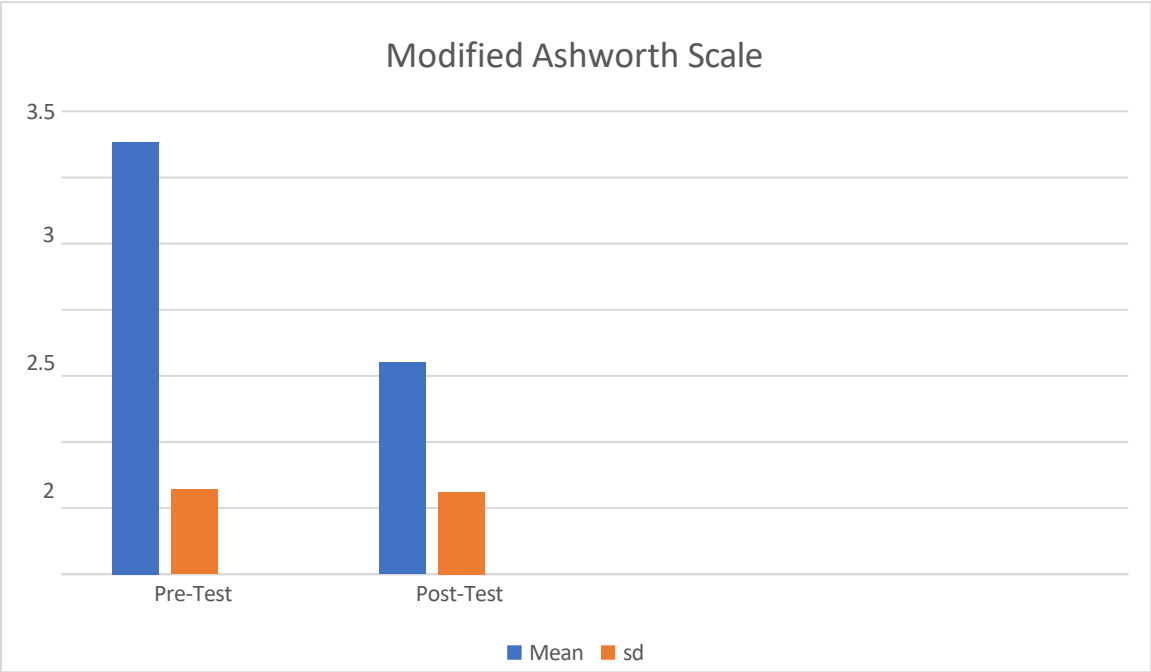
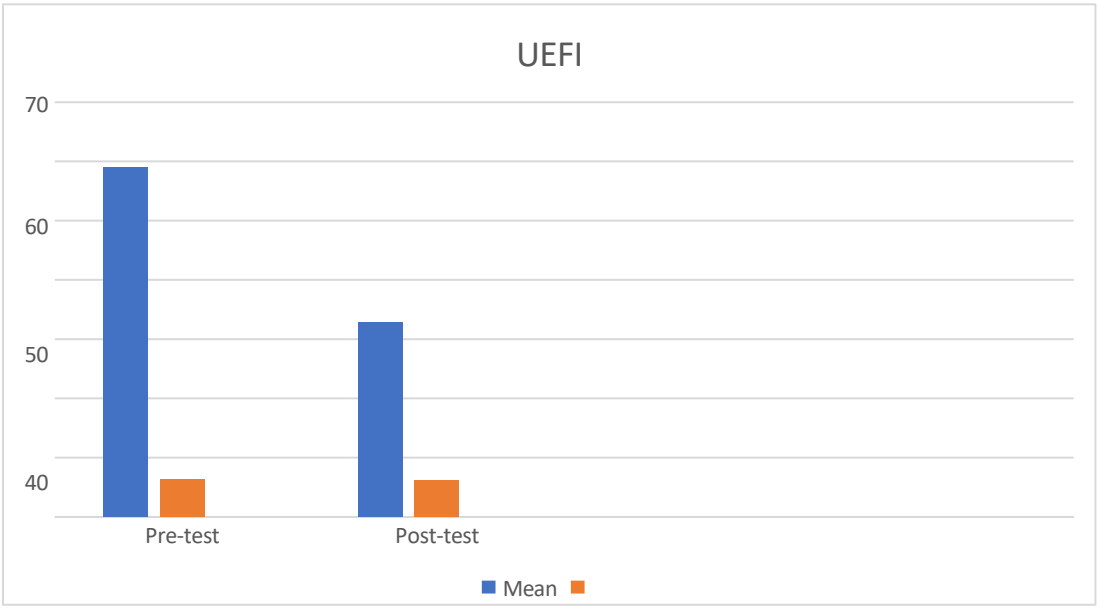


Table-2: PRE-TEST AND POST-TEST MEAN VALUES OF UPPER EXTREMITY FUNCTIONAL INDEX.

UEFI (Upper Extremity Functional Index)		Mean	SD	t-value	p-value
	Pre-test	58.93	6.37	20.4804	<0.0001
	Post-test	32.77	6.12		



DISCUSSION:

The most prevalent mobility issue that affects a child's development is cerebral palsy. A disorder known as hemiplegia affects only one side of the body. A sort of contemporary therapy called constraint-induced movement therapy restrains the undamaged body portion and compels the usage of the injured side. With the use of a sling, mitts, plaster cast, gloves, and bandages, the unaffected or less severely injured arm is confined.Taub et al. [2002] claim that CIMT induces a sustained increase in the use of the hemiparetic arm via two interconnected but separate mechanisms. The patient now receives positive reinforcement for use of

the weaker arm while also suffering negative consequences for attempts to use the constrained stronger arm, counteracting the non-use of the more impaired arm learned during the acute and early subacute periods.

The bulk of these case studies, as well as Pierce et al.'s (2002) and Charles et al.'s research, used modified CIMT procedures, also referred to as "kid friendly" methods. These studies may differ from the typical adult protocol in a number of ways, but they typically involve using a mitt, splint, or sling instead of a cast for constraint, reducing the amount of time spent each day using the constraint, reducing the amount of time spent shaping, reducing the number of treatment days, offering therapy in the home environment, and incorporating therapy activities into play.

DeLuca et al. state that there has been a wide variation in how long people have used the restraining device, ranging from 24 hours per day to just 2 hours per day. Formal therapy sessions have lasted anything between two and six hours daily. Children in the crossover group, also known as the original control group, shown significant influences on measuring occasion and saw significant improvements after CIMT on all measurements. After three weeks of CIMT, the kids had mastered an average of 8.4 whole new functional motor activities, including pointing, grabbing, gesturing, and crawling, none of which had ever been seen in them before.

According to Taub et al., attempts to use the deafferented forelimb resulted in incoordination and failures. The three-limb pattern, which was initially necessary after the spinal chock, was positively rewarded.This study found that children with hemiplegic cerebral palsy aged 3 to 11 years have improved upper extremity functions thanks to constraint-induced movement therapy. One of the outcome measures, the Modified Ashworth Scale, is used to assess the degree of spasticity in the arm, and UEFI (Upper Extremity Functional Index), another measure, is used to assess the arm's functional capacity. Both outcome measures' pre- and post-test values were computed. The data is tabulated, and the paired t test is used to determine the mean standard deviation.

LIMITATIONS OF THE STUDY:

1. The study was done in a short time with a limited number of subjects.
2. No proper follow-up data was collected.

RECOMMENDATIONS:

1. To make the study more valid a long-term study with a large sample size is recommended.
2. Further studies are recommended to analyze the effects of other modified exercises regimen.
3. Regular follow-up should be done.

CONCLUSION:

The results of this study show that constraint-induced movement therapy is beneficial in enhancing upper extremity functions in children with hemiplegic cerebral palsy. The use of the affected arm assists them in demonstrating their strength by making it mobile, reducing the affected arm's stiffness, and generally enhancing their quality of life.

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